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The relative cost-effectiveness of PCNL and ESWL for medium sized (≤ 2 cms) renal calculi in a tertiary care urological referral centre

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Abstract

There is a paucity of cost-effectiveness studies in India comparing PCNL and ESWL in the treatment of renal calculi. We are dependent on costing studies from western literature, although the nature of expenses in developed countries is quite different from those in India. This study compares the two procedures with regards to cost-effectiveness & efficacy in clearing medium-sized renal calculi (≤ 2.0 cms) at our institute. All costs borne by the patient & the institute were taken into account, including equipment costs, stay charges & cost of travel incurred, for repeat visits to the institute. The groups compared had similar stone characteristics & were from our early experience with the two methods. All costing was done at 1998 rates by submitting case sheets to a fresh billing. PCNL, was significantly more efficient at clearing calculi (94% vs 69%) than ESWL, but patients needed hospitalization. The requirement of ancillary procedures was significantly less with PCNL than ESWL (1 vs 35) and ESWL was more expensive although the difference was not statistically significant. High initial cost of a lithotripter along with the need for repeated visits to the hospital for clearance of the calculus contribute to the increased cost of ESWL. PCNL ensures clearance of calculi at a single hospital admission with minimal morbidity.

Keywords: Kidney Stones; SWL; PCNL; Cost-effectiveness; Medium Sized; Indian

Introduction

PCNL and ESWL have revolutionized the management of renal calculi in the last two decades. There are many western studies comparing these two modalities with regard to cost efficacy & clearance rates. ^{[1],[2],[3]} These uniformly state that while PCNL has much higher clearance rates, ESWL is more cost-effective for calculi below 3.0 cms in size. Would these hold true in an Indian setting as well? So we decided to compare the cost efficacy & clearance rates of PCNL against ESWL for medium sized (≤ 2.0 cms) renal calculi at our centre, a tertiary care urological referral hospital.

Patients and Methods

The lithotripter used was the Sonolith 3000 (Technomed), a spark-gap second generation lithotripter, used at a setting of 13 kV (12 kV in children). Shock waves were ECG gated with a frequency of no more than 120 / minute. Stone localization was by ultrasonography and only a few patients required sedo analgesia.

To avoid any bias in patient selection, the PCNL group was drawn up from our early experience (1986-1989), at which time ESWL was not available to us. Hence calculi which would otherwise be treated by ESWL, were treated with PCNL. The first year of experience with ESWL was used as the study group of ESWL. This ensured that the 'learning curve' was similar in both the groups.

The criteria for inclusion in the study were patients with renal calculi <2.0 cms in size which were suitable for ESWL. All calculi in the kidney regardless of location were included in this study. All kidneys were normally functioning on IVU. Patients who were planned for combination therapy were excluded from this study. Patients with ureteric calculi who required a push pre-ESWL were also excluded from the study.

77 patients treated with PCNL between 1986 & 1989 and 283 patients treated with ESWL between 1989 & 1990 were compared. The clearance rates, ancillary procedures required to clear calculi and cost of the procedure to the patient were compared. Also assessed were morbidity of the procedure and the dropout rate before the completion of treatment. Patients in the PCNL group received 1-3 treatments, while those in the ESWL group required 1-9 treatments.

The costing for these patients was done at 1998 rates by submitting the case sheets for a fresh billing. The factors taken into account include operative and anaesthesia charges, use of Operating Room and fluoroscopy time and material and stay charges. Also included for the ESWL patients was the cost of travel for additional sittings. Travel costs were calculated for the patient and one relative. There is undoubtedly some amount of 'centre effect', which can be attributed to the increased travel cost to the patient as this is a tertiary referral centre. The costs of procedures mentioned in the study were not actually paid by the patient, but that incurred by the hospital in clearing the calculus.

Statistical analysis was done with accumulated data using a stone free (complete clearance) outcome as the end point of analysis.

Results

The patient demographics are given in [Table - 1]. The treatment data are mentioned in [Table - 2]. Patients lost to follow-up were excluded from the analysis.

Of the 77 patients in the PCNL group, 73 were completely cleared, 1 patient required an ureteroscopy & 3 patients were kept under observation for the so-called 'clinically insignificant residual fragments'. This gave an effective clearance rate for PCNL of 94.03% (73/77). In the ESWL group, 257 patients were available for analysis of outcome. Of these, 35 patients required a PCNL, for clearance and 44 patients were placed under observation for 'clinically insignificant residual fragments'. This gave an effective clearance rate in the ESWL group of 69.3% (178/257).

The re-admission for ancillary procedures (1 vs 35) and average retreatment rate was lower with PCNL than with ESWL (1.14 vs 2.05). Patients coming for ESWL, especially those from a distance, incurred a significant travel cost

while coming for repeated sittings. All the PCNL patients were cleared in a single hospital admission with only one patient requiring 3 stages and 9 requiring 2 stages. When actual costs were computed for the two groups, the average cost to clearance in the PCNL group was Rs. 17,350 and in the ESWL group Rs. 20,347. There was no statistically significant difference between the 2 groups. The results are given in [Table - 3].

1 patient in the PCNL group required a blood transfusion. As this was in our early experience with PCNL, the multi-staged procedures were due to difficulty of access or poor vision due to bleeding. A significant number (35 of 283) of the ESWL patients needed re-admission for clearance by PCNL. The DJ stents placed in this group were removed after 4 weeks. There was no charge for DJ removal.

Discussion

Nowadays, patients demand treatment with a minimal cost and morbidity in as short a time span as possible.

There is a paucity of cost-effectiveness studies in India comparing the 2 modes of therapy. Economics dictates that once a patient is given ESWL, we are obligated to clear the calculus at minimal extra cost to the patient even if PCNL is required.

The end point of treatment was determined when the patient was stone free on a plain film. We now believe that for a treatment to be regarded as successful, the patient should be stone free on a plain film at the completion of treatment. There is no place for any residual fragment to be regarded as insignificant. So, clearance indicates a 'complete clearance' on a plain film at the completion of treatment. Both groups were analyzed as to ancillary procedures required for clearance of calculus, which added to the morbidity and cost of the procedure to the institute and the patient. The cost incurred by the institute of ancillary procedures was added to the cost of the procedure. There was no mortality in either group.

What we find when all these factors are considered is that PCNL was clearly more efficient at clearing calculi than ESWL (94% vs 69.3%, $p < 0.05$), although the PCNL group was from our very early experience. Also, if anything, ESWL is more expensive, even if it is not a statistically significant difference (Rs. 20,345 vs Rs. 17,350). ESWL is still a relatively expensive option for many centres in our country and the necessary PCNL expertise is required to clear the calculus in case ESWL is not successful.

We do not believe in giving ESWL for very large stones especially larger than 3 cms.^[3] Although nowadays our policy is to give ESWL for stones less than 2 cms, there are a few factors which preclude giving ESWL.^[4]

It is difficult to get an unbiased comparison these days, as the stone population going in for ESWL is quite different from that undergoing PCNL. This is the reason why the early PCNL group was chosen considering that ESWL was generally not available to us (or to most others in India) at that time. The early experience with ESWL was used to negate the effect of the 'learning curve' of the 2 procedures. This learning curve has affected the results of both the procedures in this study. The PCNL group has 10 patients requiring multiple stages, while in 1999 a stone of this size would always be cleared in the same sitting. Also the average admission time is much higher in this group than it would be today (8.1 days vs 4 days [1998 figure]). The ESWL group also suffers from this learning curve. The average number of shocks in this study is 3975, while a similar stone size in 1998 gets an average number of 1724 shocks. Also, there are a large number of stentings (13.41%) while our 1998 figures for similarly sized calculi is lower (6.25%). This is also a reflection on judicious selection of stones these days for ESWL. We prefer not to give ESWL to lower calyceal calculi with an unfavourable PCS configuration.^[4] ESWL is also avoided for very dense calculi and whenever more sittings are anticipated, especially if the patient lives at a distance from the institute.

The poorer results of ESWL in this study as compared to PCNL are probably due to: i) poor compliance of the patient for repeated sittings leading to a large number of patients being lost to follow-up (9.18%). PCNL is cleared in a single hospital admission thereby follow-up is not essential; ii) ESWL patients required a large number of retreatments (average 2.05) i.e., on an average every patient had to come back for another treatment; iii) ESWL patients had a high re-admission rate (35 patients, for PCNL), while the PCNL group had only one re-admission (for URS). This was similar to that seen in other studies;^[1] iv) the initial investment in a lithotripter is very high leading to a higher cost per patient.

Conclusions

This is the first study to compare PCNL and ESWL in an Indian setting. This study substantiates the consensus felt by many Indian urologists that ESWL is more expensive when all costs are considered. The initial investment in a lithotripter is much higher than that required for PCNL. Although the learning curve for PCNL is steeper, with adequate training at residency level in most centres these days this factor is not felt so acutely. Patient compliance in our country is low (approx 10% lost to follow-up) due to a reduced lack of awareness. Also, any small residual calculus can no longer be considered insignificant for fear of recurrence. Taking all these factors into account, PCNL in our settings is definitely a cost-effective and viable alternative to ESWL even for medium-sized renal calculi.

References

1. Saxby MF, Sorahan T, Slaney P, Coppinger SWV. A case-control study of percutaneous nephrolithotomy versus extracorporeal shock wave lithotripsy. *Br J Urol* 1997; 79: 317-323. [↑](#)
2. Mays N. Relative costs and cost-effectiveness of extracorporeal shock wave lithotripsy versus percutaneous nephrolithotomy in the treatment of renal and ureteric stones. *Soc Sci Med* 1991; 32: 1401- 1412. [↑](#)
3. Murray MJ, Chandhoke PS, Berman CJ, Sankey NE. Outcome of extracorporeal shock wave lithotripsy monotherapy for large renal calculi: effect of stone and collecting system surface areas and costeffectiveness of treatment. *J Endourol* 1995; 9: 9-13. [↑](#)
4. Sabnis RB, Naik K, Patel SH, Desai MR, Bapat SD. Extracorporeal shock wave lithotripsy for lower calyceal stones: can clearance be predicted? *Br J Urol* 1997; 80: 853-857. [↑](#)

TABLE I

Patient demographics

	PCNL group	ESWL group
No. of patients	77	283
M:F	59:18 (3.3:1)	204:79 (2.6:1)
Average age (range) yrs	38.6 (19-66)	39.2 (5-84)
Lost to follow-up	0	26

TABLE II

Treatment Data

	PCNL group	ESWL group
Calculus size – cms	1.52 (0.8-2.0)	1.40 (0.4-2.0)
No. of treatments	1.14 (1-3)	2.05 (1-9)
No. of Shocks	–	3975 (800-17,800)
DJ-stenting	0	38
Blood transfusion	1	0

TABLE III

Results

	PCNL group	ESWL group
Patients analyzed	77	257
Ancillary procedures	1	35
Residual fragments	3	44
Clearance rate	94.03% (73/77)	69.3% (178/257)
Cost (1999 rates)	Rs. 17,350	Rs. 20,345